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SOME

HINTS

FOR

Wade 139

The better IMPROVEMENT of

HUSBANDRY,

And REDUCING it to a RATIONAL and
INTELLIGIBLE SYSTEM.

IN A

LETTER

Humbly Submitted to the CONSIDERATION

OF

His Excellency the Right Honorable

THE

EARL of HALIFAX

LORD LIEUTENANT of IRELAND, and
PRESIDENT of the DUBLIN SOCIETY for the
Encouragement of HUSBANDRY, &c. And the
Rest of the MEMBERS of that

Ann. H. 26.

RESPECTABLE BODY.

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H I T S

FOR

The Patent Office of

HUSBANDRY

And R.

L E T T E R

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of

H.

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Chris.^d TO THE *Wade*

R E A D E R.

SHORT and deficient as the following sheets are, relating the subject they treat upon; yet the author has been insensibly led on to exceed the bounds of his original intention; and now that he sees his performance dressed in another form than that in which he gave it the printer; candour obliges him to apprise the reader of some of the deficiencies he is conscious it is replete withal: and disowns the vanity of claiming any other merit, than what comes within the bounds of a good intention; if the reader will allow him that, it is all he presumes to hope for, and will think himself amply rewarded.

The plan he proposes for the consideration of the Respectable Body to whom he addresses it, so far as it relates to husbandry, he believes to be new. If the theory of such a plan was properly pursued, and that followed by real experiments,
a judiciously

judiciously planned and industriously executed, he flatters himself it would be productive of lasting and solid benefits to mankind.

The little specimen he has given upon fermentation to shew what he means by *theoretical lectures*, he is conscious is very deficient, upon so large, extensive and inviting a subject, but hopes the reader will, in consideration of the goodness of his intention make all generous allowances; this performance being only intended as *hints* for a general improvement, and not a *system*: particularly where he has not distinguished so clearly as he now sees he ought to have done, between the different *species of fermentation*. As in the process of making malt, he has not in its proper place at all times specified the species of fermentation, which he apprehends to be of the *vinous* kind. Again in page 28, where he speaks of the grain perishing by another stage of fermentation, he hopes the reader will indulge him, by supposing he means that of the *putrefactive* kind. In page 29 he says, grain will never vegetate when emersed in water, which is a certain fact, but the fermentation he there mentions as being prevented by the water, he would be understood to mean of the *vinous* kind; but that which he says will at last come on to the destruction of the grain, he hopes the reader will deem of the *putrefactive* kind. And of the *same* species of fermentation is that he mentions in page 37, to be in the manure so universally used by the farmer: tho' he is willing to believe, it is not without partaking in some degree,
of



of an *acetous fermentation*. And the fermentation he describes to come upon new hay, page 40, he apprehends to be of the *putrefactive* kind.

The Author particularly requests the reader will not censure him for calling horse-dung an *un-fermented* mass, tho' he owns, as putrefaction is an effect of that *species of fermentation*, the expression will admit of *objection*; but he means, that in the state he describes it, it has not undergone fermentation since its departure from the Animal. p. 37.

The experiments he relates are his own, * he owns many more ought to have been made; but hath not conveniencies here that are necessary to pursue a proper chain of *instructive experiments*; besides which, he has unfortunately lost an account of many he has made.

The zeal he hath expressed upon the article of grain being thrown away in the manner he has described, he hopes will excite an emulation amongst the ingenious and opulent, for discovering a remedy against an evil of so *serious a nature*: and that more particularly, as such monstrous sums go annually out of the kingdom for that article.

The great weight he hath shewn to be upon the *Linen manufacture* is also of a very *interesting nature*, and certainly every method should be
tried

* Except one taken from Dr. Shaw which he has acknowledged in its proper place.

tried that human invention can devise to remove such a *devouring evil*: much more might have been said on that head, but he hopes the reader will attend to the *calculations*; which he flatters himself will stimulate some more capable hand to embark in a demonstration of the absurdity of the present mode of culture.

His postscript he owns is also very short in its treatment of salt; but if he is so fortunate as to make any impression towards an amendment of the evils attending this country, at least of those he has touched upon, he will never hesitate to contribute all his little abilities are capable of, to assist in the good work, and upon the whole, earnestly hopes proper methods will be pursued, for encouragement and instruction towards a general improvement of the lands, not only to the relief of the poor, but for the emolument of the kingdom in general, to prevent such monstrous sums of money going annually out of the nation, for the provisions, that such improvement of the lands would produce.

ERRATA.

Page 15 line 17, for *destin&t* read *distinct*. p. 17. l. 1. f. dissolvable r. *solvent*. p. 23, l. 3 in note, f. as being r. *that being*. p. 24, l. 21 f. *admitted* r. *admitted*. p. 25 last line f. *speading* r. *spreading*. p. 32, l. 9 f. *raught* r. *wrought*. p. 37 l. 14 f. *raught* r. *wrought*. p. 40 l. 1 f. *familiar* r. *similar*. p. *44 last line f. *eah* r. *each*. p. 68 l. 20 f. *lose* r. *loose*. p. 73. l. 2. f. *certainly*, r. *certainly*. p. 79 l. 26. *accumilating* r. *accumulating*. p. 84 l. 16 f. *off* r. *of*. p. 85. l. 3. f. *off* r. *of*. p. 85 l. 7 f. *advntages* r. *advantages*.

May





May it Please Your EXCELLENCY,
and the Rest of the Gentlemen of
the DUBLIN SOCIETY,

THE *nobleness* of Your undertaking for the improvement of the usefull arts; Your voluntary subscriptions for the support of that liberality, which hath so abundantly appeared in Your premiums to the industrious in almost every branch, very soon after my arrival here, struck me with a reverence and regard for You, that may be better conceived, than I have power to express: And must in the esteem of every lover of his country, mark You for patriots of a superior degree; since all *Your* aim tends to the improvement of the kingdom, and *that* so amply divested of all pecuniary views, as to support and encourage such improvement by Your own liberality.

Thus generously setting Yourselves up the protectors and encouragers of industry, and the laborious arts; of course must expose You to the ad-

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dress of every man, who thinks he understands a little more of any particular branch than his neighbours: but that trouble, I am taught to believe, You undergo with pleasure; since I dare say You conclude, that amongst a multitude of dross, some sterling may be found.

For my own part, I profess it to be with the utmost deference, and highest sense of submission, that I venture to address a Body, whom I know to be so very respectable in the three kingdoms: And whether the following sheets meet with Your approbation or not; I *trust* in Your candour, and hope You will attribute the attempt, to the zeal and fondness I have for this particular branch, which I wish by every means in my power to promote; and which I once flattered myself with making some progress in: but it hath happened that I am disappointed, or at least limited in my design.

Tho' we speak of *England* as the mother, and therefore the superior of the three kingdoms; yet as a people we are *one*; and consequently all rejoice with the same voice, at our victories, the tremendous greatness of our marine, and undaunted intrepidity of our troops; in these we glory, and bid defiance to the world. But alas! how would our acquisitions revert to our foes, our unparalleled fleet dwindle into dust, and our troops into dejectedness and misery; were it not for the cultivation of our lands?

Can



Can we then be at a loss to pronounce what is the staple commodity, or the sterling art? No. 'tis husbandry; 'tis that supplies the sturdy oak; 'tis that supplies the cordage; and 'tis that supplies the food.

Can we then be too sanguine in our endeavors to reduce this important branch to a rational and intelligible system? surely not. But wonderfull it is that so little progress has been made therein, since the importance of it, must have appeared to every man who ever gave himself time to consider its use.

The few advances that have already been made towards its improvement, have been of great service; but the necessity of its being pursued, in *no* time, ever appeared more pressing than the present.

At this juncture we have competitors in our trade in every part of the world; a circumstance that should be attended to with a *jealous* eye.

The bulk of our people are the immediate manufacturers of our commodities; and therefore it should seem unnecessary to point out to the ingenious and opulent, the crying necessity of reducing the price of all kinds of provision, which is all that the *poor* workman labours for; whereas, if instead of lessening the price of that to him,
it

it should still advance, (as it has done for some Years past) for want of real and solid improvements in husbandry, is it not manifest that such advance must ultimately fall upon the price of our goods? which, will be still rendering our trade more precarious, since it will afford to our natural enemies, room to undersell us in foreign markets; they having already apparently shewn, a greater propensity to the improvement of husbandry than we have; and as a reproach to us; even upon the plan of one of our own people. ^a

The slow progress of husbandry amongst us, cannot be better accounted for, than it is by a very ingenious writer, whose merit is so great, that it appears to me, a particular misfortune to mankind, that he proceeds not in a work, he seems so capable of completing; and which every lover of his country must most ardently wish for; namely, a compleat and rational system of agriculture.

He expresses himself in the following manner.

“ The

^a The experimental treatise on husbandry, compiled by Mr. *Dubamel* and others, and by the former published in *France*, wholly upon the principles of the ingenious Mr. *Tull*, whose merit, in that invention, cannot be sufficiently praised.—And as a spur to the rousing the ingenious and rich to the improvement of this art amongst us, let them consider how incumbent it is upon them to do it, for the benefit of their country, when men amongst our enemies, of the abilities and character of *Dubamel* &c. embark therein. That thought should awaken their ideas, since it seems to threaten us with infinitely more danger; than all their boasted fleets and armies.

“ The slow progress of husbandry may be ac-
 “ counted for from obvious reasons. This art
 “ is, in general, carried on by those whose minds
 “ have never been improved by science, taught
 “ to make observations, or draw conclusions, in
 “ order to attain the truth, or by those who, al-
 “ though nature has been very bountifull, cannot
 “ carry their schemes into execution, from the
 “ narrowness of their fortunes. The former can
 “ never know more than they have learned from
 “ their fathers; the latter dare risk nothing, as
 “ their daily bread depends on the certainty of
 “ success.^b

“ Agriculture, tho’ it depends very much on
 “ the powers of machinery, yet I’ll venture to
 “ affirm, that it has a greater dependance on chy-
 “ mistry. Without a knowledge in the latter
 “ science, its principles can never be settled. As
 “ this science is but of late invention, and has not
 “ yet been cultivated with that regard to utility,
 “ and the improvement of trades and manufac-
 “ tures, as it ought and might, agriculture is
 “ hardly sensible of its dependance on it.^c

“ The just theory of an art leads directly to its
 “ improvement, as it leads to those experiments,
 “ which

^b Doctor *Homes* Principles of Agriculture and Vegetation page 2. and 3.

^c Same Author, p. 4 and 5.

“ which remain to be tried. Without this guide
 “ we may stumble on truths by accident; but
 “ when led by it, we have the secret satisfaction
 “ of thinking, that we are indebted to ourselves
 “ for the happy issue of the experiment.^d

“ The operations of bodies are to be account-
 “ ed for only from their known qualities ascer-
 “ tained by experiment. reasoning on any other
 “ plan, can never certainly lead to truth.^e

“ Agriculture does not take its rise originally
 “ from reason, but from fact and experience. It
 “ is a branch of natural philosophy, and can only
 “ be improved from the knowledge of facts, as
 “ they happen in nature. It is by attending to
 “ these facts that the other branches of natural
 “ philosophy have been so much advanced during
 “ these two last ages. Medicine has attained its
 “ present perfection only from the history of dis-
 “ eases and cases delivered down. Chymistry is
 “ now reduced to a regular system, by the means
 “ of experiments made either by chance or design.
 “ But where are the experiments in agriculture
 “ to answer this purpose? when I look round for
 “ such, I can find few or none.^f There, then
 “ lies

^d Same Author, p. 5 and 6.

^e Same Author, p. 7. and 8.

^f Though it should not be forgot that there is infinite me-
 rit in Mr. *Dubamle's* experimental husbandry.

“ lies the impediment in the way of agricul-
 “ ture. Books in that art we are not deficient
 “ in; but the book we want is a book of experi-
 “ ments. &

To what the ingenious author has said, we may add, that it has been a custom to read publick lectures on various branches of philosophy, anatomy, physick, chymistry and law; and that such lectures have been of universal service in diffusing knowledge to mankind: but no man ever undertook to read lectures on husbandry, ^h which some perhaps will be led to think, may be accounted for, from the difficulty *they* may imagine, such an undertaking would be attended with: and certainly it would consume both time and labour; but for my own part, I do not see why *lectures* might not in time, be as well executed, upon this subject as upon any of the above branches; since it certainly is not *more* complicated, than any one of them.

If a man of any moderate abilities, was engaged in a work of that kind, and would devote his time and attention to it, a great variety of useful experiments would be made, * which would unfold to mankind, the *hidden* mystery of this art:

B

and

* Doctor Home, p. 201, and 202.

^h Except some few detached pieces on particular subjects, as Doctor Woodward upon vegetation. Mr. Evelyn upon Earth &c. before the Royal Society of London.

* See the latter part of the quotation, just now given, beginning at the third line from the bottom, p. 8.

and the *greater* the variety of experiments that would necessarily attend such an undertaking, the more certain we should become, of every step we ought to take, for producing the various vegetables which the earth, with judicious assistance, is prone to furnish us in great abundance :ⁱ untill at length, by pursuing a scheme of this kind, a regular system might be formed, upon rational and experimental principles ; which the farmer observing, could never err.

The prevailing notion amongst those who are employed in the cultivation of land, is, that few or no vegetables can be produced upon the earth, without a large charge or addition of all kinds of animal and vegetable substances ;^k and therefore they conclude, the muck as it is called, to be the food of plants. A very natural conjecture for a poor illiterate man, who neither knows the qualities or composition thereof, nor conceives the operation of bodies upon each other, in any other manner than, that if he eats, it will assuage his hunger, and that if he drinks plentifully of brandy, it will make him drunk.

So

ⁱ In the last summer I raised ten ounces of wheat from six single grains without any sort of manure. I also *have now* forty-one ears from one grain. I have other ears now by me of above *seven inches* long : and I have some with considerably above 100 grains in each ear &c. &c. all raised in the last summer, *and without any kind of manure.*

^k See a confutation of this notion, in the above note.

The plough, an obedient and tractable machine, when fixed to the gears of the horses, will follow them, and will not counteract my intention, as the generality of those sort of people will; they presuming upon the superiority of their imaginary knowledge: but notwithstanding the *obstinacy* that every gentleman who has been employed in farming, must have *experienced* in that tribe of men; yet they have sagacity enough to pursue a plan which tends to their profit, when it is rendered perfectly *clear* and *intelligible* to them; as hath been confirmed by the prevailing custom now in *England* of sowing turnips, clover, and other artificial grasses, which is only a modern practice, and does not to this day prevail in some parts of *England*.¹

B 2

In

¹ A gentleman there, lately sowed turnips in his fields in *Cornwall*, took men down to hough them, and reported he intended to feed sheep with them. Upon which he became the laugh of the ignorant, who were inquisitive to know what butcher would buy his mutton, or who would eat it? Such people are more to be pitied than condemned, for tho' a lady of a very delicate palate might censure mutton so fed, as being rank, yet were it *universally* so, it might *surely* be good food for the rustick and mechanick, since by this practice, it is obtained at a lower price, than it otherwise would have been, had this improvement never been made.

In general they have an abhorrence of all practices in husbandry, that are new, or that at least appear to be so to them; and I have many times in my life regretted most heartily, the influence that some old farmers, of *supposed experience*, have had upon gentlemen; so as totally to subvert their intentions, even to a counteracting of their schemes; and that at a double expence, attended with a precarious gain, and certain impoverishment of their land.

Let us for a moment consider, why gentlemen are so easily governed, by people whom they must know to be very ignorant. I flatter myself I shall not incur the resentment of any one who wishes to see husbandry flourish, by saying it is from their either not understanding any thing of chymistry, or that they do not give themselves time to consider and enquire into the *operations and effects* of bodies upon each other; to do which of their *own accord properly*, a little chymical knowledge is absolutely necessary.

Hence we see how easy it is to account for the slow progress of the art, *You Gentlemen*, seem so ardently bent to promote; since most men who are possessed of chymical knowledge are otherways employed, either in compounding of medicines, or in healing broken and disorder'd constitutions.

Again

Again, we may observe how seldom it happens, that any man will, and perhaps he that would, cannot, devote his whole time to the service of mankind in the improvement of husbandry or any other art.

It is very true, an infinite number of books have been published upon the subject; even so many, that I think I am possessed of upwards of a hundred volumes, and I believe there are at least as many more that I cannot get.

Amongst all these writers, at least those that I have in my possession; there does not appear to me above one who devoted his time with a disinterested view, namely Mr. *Tull*, ^m whose scheme was *almost* ⁿ perfectly new, and indeed his merit was very great.

However

^m Neither can it be expected, but he had a large fortune, farming was his passion, and he could afford to try experiments. I mean not by his preference of *Tull*, to censure other writers, since most of them have merit, even the humble Mr. *Walter Blyth*, hath *his*: and it would be highly censurable in me not to allow infinite praise due to Mr. *Dubamel*, tho' the merit of his works may redound to our disadvantage, as was before mention'd in page 6. and I would not have it forgot how estimable Doctor *Homes* treatise is, *Columella*, and some others.

ⁿ I say *almost*, since he seems to have taken the hint from his observing the cultivation of vineyards when upon his travels.

However for want of a little chymical knowledge he run into some errors, which were the more dangerous, that his authority has been and is still much esteemed by ingenious and speculative men: and I cannot but wish his system was more attended to, than it is; since I can from experience pronounce, upon the *value* of it; tho' I hope I may venture to say, without umbrage to the sanguine favourers of his system, if there are any more so than I am, that I believe it capable of improvement, were proper experiments made by a judicious hand, which, in the esteem of *generous* minds, would rather *add* to, than *lessen* the merit of his invention.

This my favourite author, hastily asserted a fact, which was also somewhat dangerous; since it in some degree amounted to an abridgment of one particular method of improvement; which method, in proportion as *his* authority prevails, would diminish in its estimation and be discouraged, of which I have had sufficient proof: some gentlemen I have conversed with, when they wanted rational argument to support their opinion, having, to confute me, quoted the following passage from him.

After his various experiments upon mint, with water, earth, salt &c. he says. "The mints all
shew

shew that salt is poison to plants,"^o except those of the marine kind.

He might with as much propriety have said, that wine is a poison to man, because some have died by an excessive use of it. And with as much reason he might have said also, that water is a poison to plants, since where it abounds or lodges too much or too long, death ensues to the plants of that neighbourhood.^p With the same parity of reason he might have said water is likewise an enemy to vegetation, because grain will not vegetate, when covered with water; as will be demonstrated presently, under fermentation.

Were I to run into a full explanation of my reasons for differing from him in opinion, it would greatly exceed my present intention; since I should be obliged to trouble You with a distinct dissertation upon salts and vegetation, and therefore in this place I must beg it may be admitted as sufficient for me to premise, that from *experience* I know *salts* of almost all kinds, are a part of the food of plants; ^r and whensoever the contrary appears, it must

^o See *Tull* page 11. 3d edition

^p I would be understood, to except all aquatick plants, by the same right and reason that he excepts the marine kind.

^r I having now by me, a journal of many experiments I made with various kinds and quantities of salts upon wheat, and the exact produce of each experiment, many of which were *very great*, even 70 times the seed sown.

must arise from an over abundant quantity being employed, or its being injudiciously applied, and not from their qualities being prejudicial to plants: always meaning to be understood to *except* such, as would be particularly *specified* as enemies to vegetation, were I to trouble You with my thoughts upon the subject distinctly.

When we speak of salts to a farmer, he understands no other to be in nature, than the marine kind, and were I to say ever so much to convince him; he would never believe me; till I shew him how to *discover* and absolutely *obtain* them, which the chymists do every day, out of a great variety of bodies; and very *numerous* are the kinds of salt.

Every country housewife, when her stock of rain water is exhausted, and her ponds are dry; knows, that if she makes a lye with wood-ashes, or if she puts those ashes into hard spring water; she can wash her linnen with that water, since it will then dissolve her soap, which it would not do before the ashes or lye were added to the water, and therefore she could *not* wash with it: but if she or even her honest yeoman, should be asked what is the cause, and how those bodies operate upon each other to effect such a manifest change; they cannot tell us, that the water was hard from the mineral or vitriolick acid it contained; that the ashes abound with alkaline salts, that
the

the water very soon, from its dissolvable quality, separates those salts from the ashes; that acids and alkalies have a very powerful *specific attraction*, and that therefore the acid which before rendered the water hard, is now, by its union with the alkali, blunted and destroyed; and was there acid sufficient, the alkali would also be destroyed, and the acid and alkali together would make a new creation, known by the name of a neutral salt. But that not being the case in this operation, the salt still remains an alkali, tho' not so compleat a one as it would have been, had it been separated from the ashes by rain, or any other *soft* water.† But remaining in the instance before us, an alkali, by its quantity predominating over the acid, contributes to the business of washing, by very powerfully removing the dirt, which is its effect in the composition of soap, of which it is the capital ingredient, for without it, the soap-boiler could never unite the oil and other ingredients, of which his soap is composed.*

Some *few* farmers also know, that wood-ashes are an excellent manure, but were I to tell one of them it is the salts in those ashes, that attract the acids of the air, earth and water, which, when sufficiently united, form a neutral salt, and thereby become in *part* the food of plants; he would not believe a word I say; unless I shew him how

C

to

† See note page 24.

* Every body knows that oil and water will not incorporate but if a little alkaline salt be added, they will unite immediately.

to *seperate* and *obtain* those salts, and then shew him the *reciprocal effect* between them and an acid, after which he would be convinced; and would appear to his brethren a wonderful man, were he to speak to them upon the subject; and as this is all mechanical, quite within the reach of his conception, he would be as capable of speaking upon, demonstrating the facts, and proving the operations and effects of these bodies upon each other, as ever *Boerhaave* was.

In this place it may not be improper to inform my reader, that these alkaline salts abound more or less in *all* nature; and particularly that all *vegetable* and *animal* substances are replete with them; and that they are very important agents in the work of vegetation; but in this performance I have not room to demonstrate their effects therein, farther than what has just now preceded.

Were I to tell a farmer that all bodies contain more or less fire, and that without fire no vegetation could go on, he would never believe me, till I should *demonstrate* to him the fact by experiments, the former of which may be done by hammering iron 'till it is even red hot.

By adding common water and oil of vitriol together, the mixture would become so *hot*, as to render it impossible to hold the vessel in which it is contained in the naked hand; nay, so *intense* will be the heat, if they are added *hastily* together, as to break any glass vessel.

Strong

Strong spirit of nitre and a chymical aromatick oil being added together, will burst into flame like volcanoes :

And the latter, namely, that no vegetation can go on without fire will appear in the process of making malt, page 24. and the experiments following that.

Experiments of this kind upon the different elements and bodies which are employed by nature in the propagation of plants, exhibited before the most illiterate man, would expose to his conception the composition and operations thereof upon each other, and render him capable of making rational observations, and of drawing judicious conclusions. Might we not hope therefore, were the improvements of husbandry *properly* pursued, that the hidden and unintelligible part of this art, might be reduced to the standard of every mans capacity?

Were I to talk to one of those people of the heterogeneous bodies that are floating in the air, of its compressible and dilatable qualities, and of its use and action in vegetation, he would not believe or understand a word I should say; but

* As a proof of which, I have it in my power to say, that I have found more real use in a man who could neither write nor read, in a little experimental laboratory, than I ever did from a fellow who could do both, and whom I employed, as concluding he knew more than myself. And it certainly is not a stupidity in human nature, that renders knowledge so very difficult to acquire, but the fault is, in its not being *properly* and *intelligibly* conveyed to those who are to learn.

were I to exhibit the usual experiments to him, to demonstrate my assertions, he would immediately understand the whole.

What a pity it is then, that such a valuable and material part of the community, should be thus left in a state of ignorance, uncultivated and unimproved.

But to bring home a little nearer to our purpose, what I would be understood to mean; I must beg leave to trouble You with a little *specimen* of what might be done, upon the plan this address is intended to propose, towards the diffusing this kind of knowledge amongst gentlemen of landed estates, who would have pleasure in recommunicating the same amongst their tenants, labourers, and neighbouring farmers; and as an encouragement to gentlemen to forward every scheme that tends to the diffusing this kind of knowledge amongst the lower people; I have the pleasure to say, that in *England* I have fully convinced, even some of my *common* labourers, that water, and that even the purest water contains earth, that earth contains salt, oil, &c. that air contains a great variety of heterogeneous bodies, and that all or most bodies contain fire; and diverse other experiments which I have exhibited to them, that at last rendered them very useful and obedient, from a *consciousness* of conviction, that I suppose it would be as hard now, to alter their opinions relative to what I have shewn

shewn them, as it would have been to convince them of my assertions, without ocular demonstrations.

Suppose a farmer should be told, that fermentation is the first agent in vegetation, he would smile, and I should not be at all surprized to hear that he should pronounce to his brethren the man to be mad, who should have made that declaration.

Yet I am willing to believe, that if his landlord, or any other gentleman, for whom he has any respect, was to read the following thoughts on fermentation, *distinctly* to him, the farmer would begin to change his opinion; but were the experiments absolutely exhibited to him, he would be as perfectly convinced as I am: And as there is no other way of making such sort of people *conceive* but by their *sight*; surely too much pains cannot be taken to convey knowledge to them, in an art, in which they are so much concerned; and which itself is so undeniably the *staple* support of every people; in order to bring the same into a regular, intelligible, and rational system.

Some Considerations on the powers and effects of FERMENTATION, so far as it relates to vegetation and some other parts of Husbandry.

So few of the writers on husbandry have taken any notice of fermentation, and those that have, have done it so superficially, that perhaps it may
be

be a matter of some wonder, I should think of treating it under a distinct head; as from the silence of others, it may be deemed an operation of bodies, of no consequence in vegetation; but I think, I may venture to say, whoever favours that opinion, it is at least from their not having considered the powers and effects of fermentation; since I believe it, to be of as much importance in the work of vegetation, for the production of plants, as a male is to a female, for the propagation of any species of animals, which I trust will be sufficiently proved by what follows.

Tho' I would not have it conceived, that I mean to censure the writers on our subject with a *neglect* on this head; since, even the writers on chymistry, who are supposed to know the powers and operations of bodies on each other, better than any other set of men, have not agreed in their opinions and sentiments, on the powers and effects of this phenomena. But such controversies being foreign to our purpose; I shall pass them over, and confine myself only to what relates to our purpose in its effects.

“ Fermentation is said to be one of the most
 “ obscure processes in all nature, and has been
 “ allowed to be, by the generality of our latest
 “ philosophers, in a great measure, a mystery to
 “ which their principles will not wholly reach.
 “ Some have attempted to account for it on the
 “ *Newtonian* system; which principle is, that the
 “ expansive

“ expansive force of air, rarefied by the action of
 “ fire; or the mutual action of fire and air, is the
 “ universal natural cause of fermentation and dis-
 “ solution”.

This should seem a very rational and just principle to conclude that it operates upon, when we consider how *abundantly* air is rarefied by fire: and again when we consider the *invisible fire* * that is inherent in all bodies, accompanied also with air; which both being confined in a body or composition that is prone to fermentation; co-operate in the work thereof.

Where the *attraction* of the particles composing any *body*, shall be greater, than the *efforts* for expansion and rarefaction, made by the *air*, and *invisible fire*, no fermentation can come on.

Hence is an established fact, that fermentation cannot be brought on any *dry* body, till some *fluid* one is brought in *aid* thereof, to separate and lessen the *attraction* of the particles, composing the *dry* body.

To

* Were I to speak of fire distinctly, an inherent fire in bodies would be proved; which by the chymists is called *Phlogiston*: but as being a technical term, would not be so intelligible as I could wish to every reader, and therefore I venture to call it the *invisible fire*, which I profess to do with great deference to the writers and adepts in that branch.

To effect which, nothing within the compass of *our* enquiries is so applicable as water ; and particularly rain or pool water, they both being, naturally prone to putrefaction, ^u which is a consequence and effect of fermentation.

To illustrate the effect of water in the separation of dry bodies, I do not immediately recollect any process that will answer *our purpose* better, than that of making malt, which is performed in the following manner.

The Barley, or what other grain the fancy may dictate, is put into a vessel, adapted in size to the quantity intended to be made ; to which the water is added, till it rise considerably above the grain, otherwise in the course of its swelling, it would rise above the water. In this state it is left, untill the grain has imbibed as much water as it can sustain without bursting, and by which it is rendered very plump and large. Then being taken from the water and drained a little, it is thrown upon a floor in large heaps, the air being admitted to it as freely as it can be ; where an impregnated
heat

* Such waters having less of any acids in them, than hard spring water, and also that acids are an enemy to putrefaction : and therefore it is, that salt which is made by violent and quick fires, will not pickle fish or flesh so securely, as that made with a gentle heat, the violent boiling, throwing of the most subtle and volatile part of the acid, which is the *essential* natural part of salt.

heat soon arises, and by means thereof, the vital or vegetative parts of the seed are soon excited, w rendered active, and begin to sprout; shooting forth their little seminal leaves, and first rudiments of roots; at which time, caution should be used, to prevent the heating mass from beginning to putrefy; x and also from sprouting too long, and shooting into leaves and roots; y which would totally consume the mealy substance of the grain. It should be observed the fermentation has proceeded the better, the more exactly this sprouting is performed, which ought to be neither too much nor too little: As soon therefore, as the sprouting is sufficiently come forward in the whole heap, the grain must be immediately spread abroad somewhat thin, to prevent not only its continuing hot, which it would do from the fermentation, and which would continue, did the seed remain in a large heap, but also to prevent putrefaction coming on, which would certainly ensue at a certain period of the fermentation; but by spreading it

D

thin,

w This confirms the use of the *invisible fire* mentioned in page 23, which, altho' invisible yet is sensible to the touch: and the use of fire also mentioned in page, 18, 19, 26, 27, 29.

x A confirmation of what was said page 24, that putrefaction is an effect of fermentation.

y Which they will to a great length, and to prove it, I have now an experiment depending in a saucer without any earth, in which some of the shoots are 4 inches and a half long, and the roots near 3 inches, which together is 7 inches and a half over and above the collateral branches and roots, and they are still growing, the mealy part of the seeds not being yet exhausted; and therefore I expect they will be much longer.

thin, and admitting the air freely in at the windows, the fermentation is stoped, and *consequently* the further sprouting, and all other, the consequences, which in *this* process, would amount to infinite mischiefs, were they not, by thus spreading it, totally interrupted.

Thus the mealy parts of the grain remain attenuated, but not consumed by the process it has already undergone.

In this state it is dried upon kilns of different structures, and with different fuel, adapted to the colour, the manufacturer is desirous of having his malt, or to the fancy and desire of his customers.

From this process, we perceive water is brought in aid, to separate the dry particles of the grain, which is effected by its insinuating quality; and that in consequence thereof, fermentation is brought thereon, which otherwise could not have been, had the grain remained in *a dry state*, and the attraction of its constituting particles had not thus been broke.

Fire is found to abound in the heap of grain, even to such a degree, as to be sensible to the touch, as soon as it arrives to a state of fermentation; which will be admitted as a proof of the *invisible*

visible fire, ² and of its importance in vegetation; for what is the consequence of this fermentation and appearance of fire?—That the grain makes an effort to *vegetate*, which it could not do, till the *invisible fire* began to operate, and the fermentation rendered fit, and set loose the nutritious particles inherent in the seed, for carrying on the vital action thereof; the former of which in other words, is no other than the flower contained in the husk of the grain; which by the invasion of the water into its particles, is thrown into a state susceptible of fermentation; which dissolves the flower in such a manner, as to render it a kind of pap or milk, calculated in this process of nature, for the food of the infant fibres which shoot forth, until they shall be strong enough to fix themselves in the earth (had this operation been thereon instead of a floor) and to feed upon the nutriment there provided for them, in their more robust state.

But as this process is performed upon a floor, calculated to check the effort for growth made by the seed, the operator does it, by spreading it frequently abroad, as soon as it is *grown* sufficiently for his purpose of malting, which it should be observed, is just as the seed begins to grow, and shoots out little fibres intended by nature for roots.

D 2

Were

² This may be admitted as a proof of the *invisible fire*, as I mean not to enter *distinctly* on that subject now. see page, 18, 19, 23, 27.

Were it allowed to continue growing, from its situation, such growth could last no longer than the pap or milk, but as long as any of that remained, the growth would proceed, till at length the bare husk of the seed would be left behind, a after which, all the young shoots would expire; and if the quantity should be *large*, a very powerful fermentation would again come on, excited by the juices inherent in such young fibres, keeping the particles thereof attenuated. But if the quantity were small, the like would happen, only in a less violent degree; and putrefaction would ensue to the entire destruction of the whole.

Whereas, had the seeds undergone this fermenting process, in, or even upon the earth; they would have yielded up all their purity and goodness, strength and perfection, (leaving the bare husk behind) for the propagation of their species; and which would have been effected, by the little fibres insinuating themselves into their proper matrix, the earth; where, as soon as the quantity of food contained in the grain should be exhausted, the plant would be strong and robust enough, to feed upon and digest that, which the earth affords. Had I room, this might be more fully explained, under the articles of roots, leaves, vegetation, &c.

Hence

^a And will exactly resemble, and in all appearance be the same with that which I have many times in my life looked for and found amongst the roots of the stubble in a field, after the corn has been cut and carried off.

Hence I think we may conclude without hesitation, that as soon as the particles of a seed, are by that powerful agent, water, put into a state for decomposition; that fire* and air, seem with eagerness to catch the opportunity, of bringing in their aid to the work of vegetation, by so suddenly exciting the fermentation; which from *this process*, is very demonstrably, a very powerful and important agent in the propagation of plants; and that even, in the *first* instance of vegetation; since without it, I hope it is sufficiently proved, that the grain cannot be brought to such a state of decomposition, as to yield up its purer parts in a kind of milk, for the subsistence of so very young and delicate a fibre, as manifestly constitutes those little shoots which spring from it.

Whereas, if the grain or seed were put into water, and remained therein, it would never vegetate; but would perish and rot,† for want of that necessary and first agent to vegetation; namely, fermentation, to promote and bring on the first efforts for growth: Tho' in time, fermentation would even come on here; but for our purpose, it would be after the mischief is done, the seed perished and never to be recovered, but putrefaction would ensue: and therefore, water being thus employed, is an enemy to vegetation, since it prevents

* See page 18, 19, 23, 26, 27.

† This Confirms what was said of water being an enemy to vegetation when improperly used, see page 15, and as an absolute confirmation, see experiment the 3d. and 4th.

vents and stands in the way of a salutary, timely and proper fermentation.^b

. It perhaps may be conceived by some, that the fermentation which comes on, in preparing the grain for malting, is excited by the quantity of grain, that is laid together for that purpose; and therefore, that the same fermentation is not produced upon the seeds that we sow upon the earth; to which may be answered, that certainly the fermentation cannot be so *strong* in one or a few grains, as it will be in a *large* quantity, but as a proof that there *is such* fermentation in the seeds sown upon the earth, (tho' it must be admitted to be in a less and slower degree) let us examine the effects, and they will be found exactly the same.

EXPERIMENT the 1st.

Let one or more of the grains, which shall be lain in a heap for malting, be taken when they have sprouted and made their effort for growth, as hath been already described; and they will be found upon opening, to contain a soft pappy substance, somewhat of a *mealy* texture, *sweet* in flavour, and as *white* as can be imagined.

This

^b As was mentioned page 15. 2d. paragraph when we were confuting Mr. Tull's notion of salt being an enemy to plants by saying water is so when improperly used, and as will appear presently under experiment the 3d. and experiment 4th.

This is manifestly a great change of the substance and quality of the grain, which we apparently see is brought about by fermentation.

EXPERIMENT the IIId.

Let some of the seeds that have been sown in a field be taken up also, just as their little shoots appear above the surface; and upon opening, and examining the matter contained in them, it will be found, exactly to resemble that which is contained in the other in every respect.

From this exact similitude of appearance, I think we might very safely conclude them to be brought about by the very same means and effects.

But should what has been already offered, not be sufficiently satisfactory, I think the following experiments and observations will confirm the principle, beyond all doubt and controversy.

EXPERIMENT the IIIId.

Let some seeds that have been soaked any time in water, provided they are not rotten, be examined in like manner as the former; and if they have been soaked only a little while, the inside of the grain will be found *hard*, which is by no means like the former. If they have been soaked so long as to have burst their husks, or till they are impregnated

ed with as much water as they can sustain, and then examined in the same manner as was observed in the preceding experiments, their contents will be found, *not* to resemble *either* of the former, in *texture* or *taste*; but will be watery and insipid, and its texture will be apparently more *glutinous* than *either* of the former.

Another circumstance to shew that the seed sown in the earth, is raught upon to vegetate by *fermentation*, as being the *first* mover, is manifestly this. That the *earth* is always more or less in a *state of fermentation*, and *particularly* in the condition it is put, when we sow our seed upon it; and that as soon as the water hath sufficiently separated the *solid* particles of the seed, the fermentation in the soil communicates itself to, and is mutually excited in the seed as well as the earth, by the various agents operating upon each other to the promotion thereof, which might be very amply and clearly demonstrated, were we to enter upon a definition and analysis of earth and vegetation, in which fermentation would be much concerned; but the compass of this intention will not admit of it.

I must beg leave to add further in support of this hypothesis, that if the fermentation did not produce this effect of *vegetation* in the grain, by *separating*, and *dissolving* the particles in the manner already described; how can it be imagined, that the grain when dried upon the malt kiln, should
dissolve

dissolve so apparently afterwards in warm water when brewed? whereas, if the grain was immediately *dried*, when taken out of the water, in the *first part of the process*, and *before* any fermentation came on, it would not only become as *hard* and as *firm* as ever it was, but would make as good flower as it would before it was wet.

This clearly shews, that no decomposition is so subtle, so fine, or effectual for the purpose of *vegetation* as that produced by *fermentation*, which is permitted to go so far to the *well-making* of *malt*, as *just* to let the grain *sprout* or *vegetate*; after which, *all the art of man cannot restore it to its former texture*; which is *strongly* instanced in flower and bread made of *grown e corn*. The flower made of such is always inclinable to be damp, prone to produce insects, subject to fermentation and putrefaction, from its *specific attraction* of dampness: and bread made of it will be moist, inclinable to mould, ferment and putrefy; tho' whilst *fresh*, and made from such *newly* ground flower, it will be sweeter on the palate, than that made from sound corn; that is to say, it will have a *saccharine* taste; which further shews, how fine and agreeable it is made for the infant plant, when

^c Grown corn is such, as hath, from a succession of rain in the harvest months, remained so long in the fields, as to vegetate in the sheaf, of which there was *abundance* in the year 1756: and was one reason of the very high price of sound corn, which followed that year, to the distress of many poor families, and alarming confusion that arose in many parts of England.

E

rendered

rendered by the fermentation, fit nutriment for so delicate a fibre as springs from the grain.

Hence is the cause, why our poor mariners have their bread sometimes mouldy, putrid, full of insects, and very unfit for *their* use; who, whilst they are exposed to dangers of the most formidable kind for our preservation, against stubborn and ambitious enemies, added to the imminent hazard of the seas; they are deprived of those agreeable and *salutary* vegetables, & we have at home, and therefore, *they* of all people, ought to have the *best bread* the land affords. Whereas the manufacture of flower is now become an art, and made a mystery of, to the emolument of every knave, who can raise a capital to enter into it; when he becomes as *watchful* for a contract to supply the *navy* or *troops*, as a wolf for rapine; and by a few of which, he makes his fortune: for as soon as he has made his bargain, which he does as *hard* as possible; he sends forth his emissaries to collect all the *damaged* corn they can find, which he converts into flower; (I will not say with any baser addition) and so compleats his contract.

^d Tho' I think nature has provided a method for their being furnished at sea with a sufficient quantity of what is *exceedingly good*; which would greatly prevent the scurvy and other cutaneous complaints among them: but as I am not sufficiently acquainted with gentlemen of the navy, I have not had an opportunity perfectly to compleat my speculation, on the full practicability of such a scheme. However, I am pretty confident it may be effected in part, which I should most heartily rejoice to promote, since I think I may venture to pronounce such an article, would contribute to the preserving many of our poor men from diseases, particularly those not enured to the sea.

tract. Thus our *brave* defenders are too often supplied with food *totally* unfit for them; and the contractors on their behalf imposed upon.

But I perceive my zeal against so base a practice, has betrayed me from my subject, which I beg leave to resume.

I said before, "that if the corn was dried when first taken out of the water, it would become as hard as ever, &c." But that the fermented and sprouted corn never could recover its former texture,* to prove which, let us examine the following experiment.

EXPERIMENT the IV.

Take of corn soaked in water, till its internal part is become quite a *fluid white mass*, and gently dry it before a fire. Take also of *sprouted* corn, and dry that in like manner. Examine the former, by cutting it a cross the middle with a sharp knife or razor, and it will be found to correspond in *firmness*, with corn that *never was soaked*. Whereas the *sprouted* corn being cut, will appear as *white* as can be imagined, and of so *loose* a texture, as to *fall*, by the least touch of a knife point, into *flower*.

Can we have a greater proof, of the decomposing quality of fermentation? and that hence it is manifestly the first mover to vegetation?

To

* See page 33.

To return again a little, to the *causes*, for the *slow progress* of *solid* improvements in husbandry; here I must beg leave to ask, what *common* farmer it is, that could of himself, make these observations, and pursue even so *short* a chain of ideas and experiments? but when they are made, how *easy* is it, to make him *perfectly understand* the whole? He is always possessed of *grass*, he is always possessed of *water*, and always possessed of *fire*. Almost the only necessities, to render the powers and effects of fermentation in *his* branch; *intelligible* to him; * which he being *once* master of, he would not *any more*, out of idleness, or a *mistaken* œconomy, give his field but *one* ploughing, when it ought, for his *real profit* to have *three*, or give it *two*, when it ought to have *six*; notwithstanding his neighbour pursues the *old* plan; and is *tug- ing*, *buying* and *slaving* to get a little “*sprinkling* of *muck* upon his ground” as he calls it; and when he ploughs it for sowing, leaves it with clods as large as his bushel, and as stubborn as himself.

Having I hope, sufficiently shewn, that fermentation is not only a powerful, but the *first* agent, in the *immediate* act of vegetation; moved there- to, by *air*, *fire* and *water*; and *that*, in the *first* in- stance: it now remains to shew, that it is of the utmost consequence to the farmer in other parti-
utmost

* See page 20, where I mention my having discovered to very ignorant people, what would have been perfectly unintelli- gible to them, without being proved by experiments. See also page 16, 17, 18.

culars; the pointing out some *few* of which, will, I hope, enough establish my principles on this head.

All the magazines and collections of manure, that are brought together by the industrious farmer, at a great expence and labour, would prove ineffectual to his purpose, were it not for the power and action of *fermentation*; which from the *natural* moisture, the *rains* that fall upon, and the *various* collection of bodies of which his manure is composed, all conspiring to its fermenting and leading it to a proper state of putrefaction for the land; which receiving it *before* this operation had sufficiently raught upon it, would be productive of very little advantage to the farmer, but perhaps might be prejudicial to him; since without such fermentation, the salts of the vegetable parts thereof would not be properly formed, * neither would the acrimonious particles of the *animal* substances be properly blunted and softened; instanced in the case of *horse-dung*, which falling from the animal, and sufferd to *lie* in the field, upon the spot on which it fell, till it becomes a perfectly light chaff or dust, and then removed; the grass of that place will be for a time destroyed, by the raw and acrimonious quality of that unfermented mass; but from some part of the juices and salts thereof, which have in that spot, *enter'd* the earth, a fermentation comes on in *that place*, which alters the *nature* and *quality* of the *addition*, as well as that it *pulverises* the earth;

* See experiment the 5th. page 39 for a confirmation.

earth; and therefore a fresh and new creation of grals will vigorously and spontaneously shoot forth, at a certain period. But when manure is laid upon the land in a proper state and is immediately incorporated with the earth, (which *ever ought* to be observed, tho' too *frequently* neglected) there *another* fermentation is excited by the mutual action of the manure, and earth, thus coming into contact, aided and promoted by the mechanical labour used upon them both, and the free accession of the air and celestial fire, the latter of which rarefies and expands the former, and are thereby very important agents in this operation, as well as in many others in husbandry. This new fermentation separates and pulverises the particles of the earth, rendering them fit candidates for the water to suspend and carry with it into the plants: * and thus arises the benefit of manure in a great measure; which might be more fully explained were we to enter into a discussion and analysis of the different manures, earth, water, salts, &c. and which will in some degree appear by the following experiment; it certainly being a very extraordinary effect of fermentation.

EXPE-

* Water is *no more* than the *vehicle* to convey the *nutriment* into the canals and passages of all animal and vegetable bodies; and were we to enter upon vegetation, earth, water, &c. we should very easily prove, earth, salts &c. to be the food of plants, and *not water*, as Mr. *Helmont* by his experiment on the willow, endeavoured to prove, and from the plausibility of his hypothesis drew many very ingenious men astray in this particular. Besides which, his veracity in this experiment is much to be doubted; "since the extravagance and untruths, to be met with in his "magnetick cure of wounds, have made his testimony suspected in his other writings". for this impeachment see The honorable Mr. *Boyle's* works last Fol. edition 1 Vol. page 313 b.



EXPERIMENT the Vth.

Take a quantity of any tender juicy vegetable, such as lettuce, the leaves of cabbage &c. and put them into a tub, keeping them pressed down with a proper weight upon them, and having a plentiful number of holes bored in the sides of the tub, for the free admission of the air, and setting it in a warm place, a putrefactive fermentation will come on, that will in a few days convert the whole to a putrid pulp; a part of which being distilled in a glass retort, will afford a volatile salt and oil, resembling that obtained from hartshorn or any other animal substance; and an impalpable earth I apprehend will be left behind; an effect that no other natural operation will produce, or however not so effectually to decompose the different bodies we find these vegetables replete withal for the food of plants, of which this impalpable earth is certainly a part.

Thus we see how this operation of nature changes the vegetable creation, into a capability of
F * producing

^f Any one who would wish to see a further explanation of this experiment will find it much fuller in Doctor *Shaw's* chymical lectures, 2d Edition page 134, 5, and 6.

producing bodies similar to those obtained from the animal; and thus effects arise that are of the greatest importance for the improvement of the native soil; for these salts when formed in the manner this experiment describes, are dissolved by the waters that attend the operations of nature in various forms (as air, dew, rain &c.) and carries them with it into the different parts thereof, where they answer several other purposes, such as, by a further action on the earth, contribute to the pulverizing of it: themselves in due time becoming neutral by their specific attraction of the acids that abound in various forms, and resume their former state of vegetables, by becoming in their neutral state, part of the food thereof. The resolving power of this putrid fermentation renders the earth of the vegetables, and other fermentable bodies, impalpable, and therefore fit for the food of plants, since when it is so reduced, it will be carried by the water * into the canals and passages thereof, and being there deposited, will again become a part of the composition of vegetables.

Again, if beer upon being brewed, or the juice of any fruit, such as grapes, apples, pears, or of any other vegetable, immediately upon being expressed,

* See the note page 38.

expressed, were distilled before undergoing a vinous fermentation, no inflammable spirit would be obtained. But the juice of any fruit, or even the sap of birch, walnut, or I suppose of any other tree, water and sugar, water and honey, or any other liquor capable of, and after suffering a vinous fermentation, will upon distillation afford a great quantity of an inflammable spirit, which is esteemed "the criterion or inseparable effect of vinous fermentation," but if the next stage of fermentation, which is the acetous was admitted to come on, which it naturally will after the vinous, such liquor thereby, would in a great measure be divested of the vinous and inflammable quality it was before replete withal, since it will not then upon distillation afford any inflammable spirit, but instead thereof emit an acid aqueous liquor, which is the criterion of an acid fermentation. And it may not be improper to add, that where there is a sufficient heat, all liquors that are capable of an acetous fermentation, will, if not prevented by human interposition, immediately proceed on to the putrefactive fermentation, which will totally destroy them.

Hence we have opened to us, a method for examining very satisfactorily into the various stages and species of fermentation, in the different cases in which nature employs it in the various operations

tions incident to husbandry; since by the distillation of the different manures, and that in their different degrees of fermentation * we could easily ascertain what is the proper one for that article of husbandry, as we should thereby discover the quantities and qualities of the salts, liquors, oils and earths we should so obtain, which would lead us to regular rules for the judicious and proper preparing of the different manures, and some others not yet in use. We should also be led to know in what stage fermentation operates in vegetation, were we to distill corn just as it begins to sprout, tho' I think we may safely conclude it is of the vinous kind. And were we to distill corn that is growing, we should also discover what species of fermentation is there concerned, in which it certainly is, and I am inclined to think it of the acetous kind, as such a fermentation must contribute to the rendering neutral the alkaline salts which abound in the earth manures &c. and thereby become in part the food of plants, † which in their natural alkaline state, I know from experience are enemies to vegetation.

These

* I am inclined to think, that altho' the putrid fermentation seems to be the principal one in this case, yet an acid one is in some degree concerned, at least in the first effort of the mass to ferment.

† See page 14, 15, 16, 17, 18.

These few hints may afford to us an idea, how nature sports with this phenomena in many of her operations, and indeed wonderful are its powers and productions : it should therefore seem, that its effects, use and powers in the vegetation, digestion and production of plants, and the other concomitants with the branch before us, cannot be too much attended to, for the discovery of advantages it may afford.

A great deal more might be said on the subject, but I hope what I have offered will be an incitement to abler hands, to pursue and bring to light benefits that I am persuaded it is replete withal, towards the improvement of husbandry ; for to the greater height fermentation can be brought, in its operation on the earth, before we sow our seeds upon it, by so much will be increased the fertility of the land ; and even afterwards all assistance should be given that can be, towards carrying on the same operation, only that it should not be in so violent a degree, as that which every farmer should endeavour to excite upon his fallow grounds ; neither should it be so violent on grass lands ; but a gentle and constant fermentation of the acid and putrefactive kind should be promoted as much as may be ; but being more violent, it will destroy the
grass,

grafs, corn, &c. * as was instanced in the case of raw horse dung, page 37. besides which, where the fermentation is violent, it will force all plants out of the ground, whose roots are naturally superficial; an effect also frequently produced by frost.

As what I have hitherto said, serves principally to shew the advantages of this phenomena to the farmer, it may not be improper to shew also, how it is sometimes destructive to his property, and therefore in that case ought to be attentively guarded against.

It is no uncommon thing, for hay to be put together in a rick before it is sufficiently dry, or to use the farmers term, *enough made*; in consequence of which, it begins to *heat*, as he calls it, which is no other than the *effect* of fermentation, which I take to be of the putrefactive kind, arising from the too great portion of sap that remains in the hay, operated upon, and excited by the mutual action of the air and *invisible fire* which remain in the vegetable, from the sap or water keeping the particles or fibres thereof, at a *greater* distance from each other, than they *would* have been, *had the hay been dried enough*, * but that not being

* This fact I have experienced in many cases, some large rooted plants have been in part cankered and in part putrefied, others wholly putrefied and the, smaller ones have died and disappeared almost insensible, by their little roots having been totally destroyed by the putrid fermentation and pungent salts produced thereby.

* See page 23, 24, 25, 26, 29.

being the case, the fermentation comes on in *too violent* a degree; which not only, very frequently *scorches* the hay, which is otherwise said to be *mow burned*, but very often a blazing fire will burst forth, to which the hay is the fuel, and the whole collection is consumed into ashes. The same effects will happen sometimes in ricks of oats and barley, but very rarely or never in those of wheat; the straw being usually hard and dry, before the corn is cut, and consequently the straw is very stubborn, and cannot be pressed into such immediate contact, as the softer and more flexible grasses and straws; and therefore, unless wheat be cut and put together, whilst the straw is green, it is not subject to this destructive effect of fermentation.

Thus I have ventured to offer to the consideration of your Excellency, and the Gentlemen of the Dublin Society, some hints to shew the powers, effects and importance of fermentation; which being pursued by some more capable hand, I am encouraged to hope will be found one of the most necessary and powerful agents in nature, not only in the branch before us, but many others. But what I *have* offered, I should not have risked by itself, did I not *rest* my *firm reliance* upon Your candour; since it comes before you, without any reflections upon the other subjects, which, were *lectures* to be given, should precede this, as upon fire, water, air &c. in which, the heterogeneous particles in those and *all other* bodies, *concerned in vegetation*, should by experiments, be laid open

and demonstrated, which would in a great measure, lead us to a discovery, of what is *really* the food of plants.

I would not be understood to mean, that such a scheme should stop here; no. The lecturer should have a certain quantity of land appointed, and in *that*, as great a *variety* of kinds as could be obtained; for the purpose of carrying the experiments made in his theoretical lectures, into further execution by *real vegetative* experiments made upon the earth, in order to establish, by undeniable and positive proofs that which must lead to truth; by planting, sowing, transplanting &c. and that to be pursued by all the *various* methods, that the seasons, land, speculations, and circumstances of the different cases and inventions could possibly afford or admit of; and that a regular journal be kept of all the different effects and productions thereof. That at certain periods, those experiments should be related or read before the Society; and such as should be found not only successful but *advantageous* should be published to the world once a year, or as frequently as your Society may think proper. §

By a scheme of this kind, properly carried into execution, many errors would be detected, and national advantages discovered; from which, in a few years we might reasonably hope to obtain, that
which

§ See page 7 and 8.

which seems to be infinitely wanting : namely, a rational, clear and intelligible system of husbandry, founded on facts, which being thus proved by experiments, would therefore admit of no impeachment or controversy.

How infinite would be the pleasure to the Society themselves, frequently to visit such experiments, and view the different stages of their progress? what a field it would lay open to them, to communicate to their tenants and neighbours in the different parts of the kingdom, for a general improvement of the country? Here no discovery would die with the experimenter; he would be a servant of the publick, and the discoveries of his labour, turn to the emolument of mankind. He would be happy in the patronage and countenance of men of the noblest minds; which would be a shield to him against the malevolence of the nibbling critick, whose aim too frequently, seems to be calculated to intimidate every individual, ^h who perhaps

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^h Verified in the case of Mr. *Dossie*; who was the author of the *Elaboratory laid open*, 1758. and the *Institutes of Experimental chymistry* 1759, both which works, notwithstanding their great merit, were lashed in a pamphlet intituled, *Remarks on Mr. Robert Dossie's Institutes of experimental chymistry*; with a cruelty that betrayed the criticks design to prejudice Mr. *Dossie* in the esteem and good opinion of the Society in *England* for the encouragement of arts, &c. But tho' he could not annihilate the merit of Mr. *Dossie's* performance in the esteem of that Society; yet, the attack was no less invidious; and might lessen the use of his books amongst learners, which would be productive

of

perhaps might be capable of offering hints that might be improved by others; but rather than expose himself to a publick censure, or the danger of a paper war; he perhaps burns his manuscript, and his discoveries are lost with him.

So that upon the whole, a compleat, rational and intelligible system of husbandry, founded upon repeated and able experiments, seems impracticable ever to be acquired, (since there appears to be such a variety of impediments in the way;) without some publick and noble patronage to support, encourage, and protect the attempts thereto: and I confess *here*, I see no society or body of men; so likely to bring about this great work as *You* are, who *have* shewn, and do daily *continue* to shew, so sanguine a desire of raising Your country to a credit and riches it has not yet known; and which her soil is abundantly capable of affording.

A scheme of this kind properly carried into execution, judiciously planed, and industriously executed, by a man who should delight in this kind

of two evils, first: that it hurt the author, and secondly, that it abridged the progress of the knowledge his institutes will convey to every learner of chymistry. Again, how often may it happen, that a man may be capable to convey his meaning and discoveries to the world; but if wantonly and maliciously attacked, perhaps cannot defend himself and his intention with that spirit and abilities Mr. *Dessie* has shewn in his pamphlet of *Refutation on those remarks*. — Yet I would not be understood to mean, that there is no merit in judicious criticism; which on the contrary might give the criticized author an opportunity not only of *amending*, but of *improving* his work.

of science (for so I would fain have it called and established) would I think, be productive of immortal honor, and merited praise to every member of Your Society; and (what I am persuaded, is more *Your* wish) of lasting and solid benefits to Your country.

Whereas the advantage of the plan You seem to be now upon; *noble, bountiful, and well intended*, as it is *known* to be—(pardon my saying it) seems to be only *temporary*; since You leave the *unlearned farmer* still to make the improvements; which he is *not capable* of doing, *beyond that of a day*; and who the more eagerly attempts it, for the hope of gaining Your premium; which seems to have been sufficiently verified, in the case of a certain person in this kingdom, who some years ago, i gained Your premium for raising more *wheat* than any other man could upon the like quantity of ground: ^k But so destructively was the land treated, that I believe I may venture to pronounce, it very soon lost that fertility, and would become very barren, unless it was suddenly laid down again: And so sensible the gentlemen

ⁱ In the year 1742.

^k I have often in *England* read the account of that process with attention, and as often in my own mind condemned it, and really concluded the author of it to have been betrayed into it for the sake of the premium; but since I came here, I have been informed he is a man of considerable fortune; and therefore change my opinion, and now conclude he was allured by the honor his carrying the prize would afford him; not considering the mistaken principles he would gain it upon.

men of this kingdom seem to have been of the impropriety of that scheme, that I see an express act of parliament has passed to prevent the practice of burning land, ^l which I perceive has been continued from time to time; tho' perhaps that may have been too sanguine; since in some cases it may be useful, which I shall endeavour to shew presently.

The scheme and extraordinary produce just now hinted at, made a great noise, and without doubt was the admiration of many: ^m but where is the advantage that has arisen from it; since it has not been pursued? and why has it not? the reason is manifest; since such a treatment of land, in the condition *that* is described to have been in, before it was burnt; was calculated for an *immediate gain*, ⁿ without affording any other standing rule for others to pursue, than that it would be highly improper to repeat the experiment; since it is a very barbarous treatment of *good* land, and were it universally to prevail, *upon the plan that gained the premium*; in a few years, it would be attended with danger of famine.

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^l 17 Geo. II. c. 10. made for two years, which has been continued from time to time.

^m Nay, perhaps so much as to have set half the tenants in the kingdom upon burning their turf, since they could not assign the cause of that great fertility, nor foresee the fatal consequences; and very probable that was productive of the prohibition which so soon followed.

ⁿ Moderation will not permit me to think the author of it foresaw the destructive consequences that must ensue.

My present intention will not admit of my entering into a definition and description of the different methods in which burning of land might be practiced to advantage. But it may be observed, that I have just marked that, which "gained the premium" as being destructive, and therefore all such schemes should be *confirmed by real experiments*, calculated upon *rational* principles, and those *proved* as far as may be, by *analyzing experiments*; and the different *effects* accounted for rationally and clearly, before any such *tempting* scheme should be let *loose* to the *practice* of the farmer; which (pardon my saying it) seems to indicate a *danger* in offering premiums at random; amongst a set of men who cannot account for the causes produced, by the action of bodies upon each other, for want of knowing their contents; and therefore if one man hits upon a method of raising a great crop, induced to the attempt by the premium offered; the good and generous intention thereof may be productive of great evils; since the farmers may, by the *momentary* success of him that carries the prize, ° lead themselves into as great a confusion, as an army will be in, when by an enemy betrayed to famine; which would be attended with *two* great mischiefs. First, that of the temporary prejudice done

° I am willing to believe, they would be more likely too, to follow any such scheme discovered by one of themselves, than if a man of knowledge had been the author of it; which still encreases the danger.

done to the land; and secondly, that all these people, and their sons, would be confirmed *unalterably*, in a resolution never to listen, or enter into, any *new* method that might be productive of lasting benefits; tho' confirmed by *experiments* made upon the most *rational* and *solid* principles.

Under these considerations permit me to hope You will consider, how much more numerous and extensive would be the advantages arising to this branch, (which You have given such solid proofs of Your anxiety to promote,) upon the plan I have proposed, than can possibly be expected to arise from the shallow penetration of the bulk of the people, who are employed therein; and to whom Your premiums are extended, without any *kind* of *instruction* to their *assistance*, but from a *hope* of gain, they are *excited to undertake*, what they are not *taught* to execute.

I said before, that I would endeavour to shew, in some cases, that the burning of land may be useful; and I really think, upon *proper* subjects; it is an excellent practice; as in the case of land that abounds with weeds and rubbish of the vegetable kind; since the burning such would answer two good ends, namely, that of first destroying such pelf, and secondly, that the ashes thereof would be an excellent manure for the land; since they would be *replete* with alkaline salts, the good qualities, powers and operations of

of which are not known to the farmer, ^p nor how much they abound in all nature; particularly in the branch of business in which he is employed. And there are some other cases in which burning might be productive of great benefits in a judicious hand; but such a treatment of *highly improved* land, would be *murdering* of it, for a *present* gain: whereas the *true* method of managing land ought to tend; not only to the obtaining large crops, but also, *ever* to have in view an *improvement* of the ground. And had the experimenter's scheme just now hinted at tended to that end; I should have honored, applauded and regarded his project, as being the production of ingenuity: whereas, I cannot help thinking, as the case was, any man that raised a much less crop, upon the stipulated quantity of ground, without so manifestly injuring the fertility thereof, had infinitely more merit.

Besides which, permit me to remind every gentleman of a landed interest, how dangerous such a practice would be in the hands of tenants, whose leases should be near expiring (and in which there should be no restraining clause) were they apprised that their landlords would not renew on the old terms. They would, as the time approaches for their quitting the farm, tear up the turf, burn the same, obtain large crops of grain, and exulting

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^p See page 16, 17, 18, where they were spoken of before as being in the wood-ashes.

ing in the ruin they had made, leave the estate, in so barren a condition, that it would cost the owner more, to restore it to what it was, than *all* the crops their tenants had so obtained should be worth, by which means the *publick* would be injured as well as the *owner*.

Having thus shewn the impropriety of such a practice, and therefore the danger that seems to await the issuing premiums in the generous manner Your sanguine desire to improve the land of the kingdom, hath wrought upon Your liberality to do; permit me Gentlemen for a moment to suppose that You had, from a great variety of experiments made and laid before You in the manner I have hinted at; discovered advantageous and judicious methods of raising wheat, adapted to the different kinds of land, and that fixing upon such method as You should prefer, You had offered Your premium to the man who should raise the largest crop upon the plan that You *had experienced*; is not the *hope* of advantage to the *publick* striking? and when the poor farmers mind comes to be *opened* and *improved*, and the *reasons* for success attending the *mode* that You should *so* propose rendered intelligible to him; might we not with *great reason* expect to see such practice *live* and *prevail*, instead of the former one which *lived not for a day*? again permit me to suppose, that if instead of the experiment which I allude to, such a one founded upon the plan I propose, had been issued twenty years ago, which is just the distance, since You gave Your premium,

premium, might we not have expected by this time, that this nation would *at least* have *furnished herself* with wheat? surely we might; and an excellent method of culture for other grain would have been established upon the *same principles*, in the course of that time; since the poor farmers, altho' they *are* obstinate; yet if they are *properly instructed*; and the *mode* of conveying knowledge to them be *adapted* to the *form* in which they *can conceive*; they *will yield* to conviction; and I never found any method so effectual to gain *that point*, as that of demonstrating my assertions by *real experiments exhibited to them*.*

I own, from a project of this kind, *variety of improvements* and *publick advantages* crowd upon my ideas, greatly beyond what the limits of my present intention will permit me to relate; and I flatter myself, no less will appear to You.

Suppose a premium had twenty years ago been offered to the man that should have raised the greatest number of *barrels* of wheat, from a peck, I was going to say, but rather *from half a peck, and that, without any kind of manure or burning?* perhaps many

* For the information of the *English*, it may be proper to observe that a barrel of wheat in *Ireland*, is equal to four bushels of *prime* wheat in *England*, a barrel being to weigh 280 pounds *avoirdupoise weight*.

* See the last paragraph page 20 where I speak of the information I have given my common labourers, and the note, page 19.

ny farmers would have looked upon such an offer as a joke; but I am willing to believe there are some speculative men, who would have considered the matter, and *tried* at least what they could have done. From what I have done myself in this way, I am capable of giving a pretty exact estimate of what quantity might have been expected for the produce; and I would not have it apprehended that I form my judgment from an experiment *nursed* in a garden; far from it; since I tried all my experiments in the *open* fields; indeed unfortunately, some of them, were too near the hedges, which afforded the devouring sparrows immediate resting places from the mischief they delighted as much in doing, as the farmers would in breaking up rich turf * and burning it, for immediate gain,

A bushel of good wheat, or a quarter of a barrel, should weigh seventy pounds, avoirdupoise. One eighth part of a bushel, or one thirty second part of a barrel will be *half a peck*, being the quantity of seed just now stipulated; which will be *eight pounds and twelve ounces*: and it should be *noted*, if it is very fine large wheat, it will be only *about* 600 grains to each ounce, but if common wheat, and raised in the common starved manner, it will run to between 7 and 800 grains to an ounce: however, we will suppose the smallest number, which will in that case be 600 grains to every ounce

* I am informed what we call turf in *England* is here called sod, and I believe more properly, but by turf I would be understood to mean the sod of a good and rich past ure.

ounce of our given quantity of seed, which being 140 ounces, multiplied by 600, as being the number of grains in each ounce, will shew that our number of grains for seed, will be 84,000. If a farmer was told, that eight half pecks make a bushel, or that ten would be a bushel and a peck, and he raised that quantity from our given quantity of seed, he would (however in *England*) think it a good crop, which is ten times the seed supposed to be sown: but if he was to raise 262 pounds and a half, which is 30 times the seed, and would be 3 bushels and 3 pecks, he would think it a very extraordinary increase: but was it to be *double that* quantity; namely, 525 pounds, which would be 7 bushels and a half, or two barrels within 35 pounds, I dare say he would not have given any man six-pence to insure Your premium to him, tho' it should have been ever so large. The experiment in 1742, with all the *burning* and *management* that was used, produced 59 times the seed sown: the quantity last mentioned, supposed to be produced from half a peck, is 60 times the seed; and to be sure they both appear to be very great, in point of produce, and certainly are so: but when we give ourselves time to enquire what really may be done, by proper care, and *extraordinary* management, which is now incumbent upon me to shew, by what I myself have really done, the extraordinary productions above mentioned of 59 and 60 fold, dwindle into diminitiveness.

Here

Here follows an experiment taken from a journal I kept of some experiments I made in England.

September the 4th, 1760. In a field, which to my knowledge for four years had no kind of manure upon it, a light soil, known to the farmers in *England*, by the name of *rye-land*, I had a bit dug exactly three feet wide; up the middle of which, I put, with *my own hands six single grains* of wheat, each grain exactly *one foot asunder*. Their manner of growing and *spreading* I confess pleased me much, and which, with diverse other experiments were much admired by many gentlemen who came to see them : but when I reaped the corn of this experiment, *August* the 9th. 1761, and came to ascertain the produce, I was indeed astonished. This experiment stands in my book in the following order.

EXPERIMENT N^o. 14 from Journal 1760.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
33 Ears.	41 Ears.	23 Ears.	25 Ears.	28 Ears.	24 Ears.
41					
23					
25					
28					
24					

174 Ears in all from 6 single grains, which, *one with another*, is 29 Ears from *each* grain of seed.

This

This produce I carefully separated from the chaff, and it amounts to 10 ounces avoirdupoise; and the number of grains are 5710, which is only at the rate of 571 grains to an ounce, which convinced me the room it had to grow in, rendered the grains larger than any I ever met with but in such kind of experiments. 5710 grains being the produce, divided by 6, being the original stock, will shew, that the produce is 951 times the seed sown, and something over, (i. e. only 4 grains.)

It may be observed that in this experiment, three superficial feet were devoted to each grain.

But suppose an experiment had been offered to the publick, in this manner; that 8 pounds and 12 ounces of seed wheat would be allowed for sowing, and that no man that should try the experiment towards obtaining the premium that should have been offered, should use more than 70,560 feet of ground, which is an Irish plantation acre; and any sort of manure employed should totally exclude him. I confess not many would have chose to sow each seed a foot asunder; but I would, * by which I should have 13,440 grains of my allowance of seed left, in order to supply the place of any that might perish or be otherwise destroyed; and certainly I would be
careful

* Or I should rather choose to sow my seed in rows two feet asunder, and each grain six inches from each other, which would occupy just the same quantity of ground, and would afford ample room for weeding, &c.

careful to keep under every appearance of weeds. Now let us examine what quantity I might expect for my produce. If it turned out in the same proportion with the experiment I have just stated, would it not be prodigious to find it amount to 99 bushels 3 pecks 12 pounds 92 grains, which is 25 barrels wanting 5 pounds 8 ounces. Such an experiment would *improve* and not *impoverish* the land; and from the *small* quantity of seed, would be a wonderful production; yet *romantick* as it may appear, I think it would fulfil the calculation; would be a *fight*, that must be *delightful*, and an experiment that I have long intended to try; having I think patience and perseverance enough to undertake, pursue and execute it.

Not that I think this the best way of sowing; since there are some objections to be made; but yet this good effect might arise, that it would convince the farmers they throw away a great deal of seed; and when wheat is ten shillings a bushel, the saving a bushel or six pecks * upon each acre, amounts upon 100 acres to 50*l.* if six pecks be saved upon each acre, it amounts to 75*l.* an object well worthy the attention of most men, but more particularly the farmer.

Ireland by some writers, is said to be about half as large as *England*, the latter of which is computed

* The farmers in *England* throw away at least that quantity on each acre, but the farmers here throw away a great deal more.

computed to consist of 39,038,500 English acres, consequently the former, upon that calculation will consist of 19,519,250. which will be of Irish plantation acres, only about 12,050,149. If we suppose then, that *only* half that quantity of land is under any kind of cultivation; * and of *that* half, *only one eighth* to be under tillage; and of *that eighth only one fourth* part is sown every year with wheat, it will amount to no more than 188,283 acres (throwing out the fractions.) Let us consider then, what an *alarming* consideration this would be, were wheat at 10 shillings a bushel, or 40 shillings a barrel; since, if the farmers throw away in seeding their ground in *Ireland* two bushels and a half upon each acre, which I am persuaded they do, † it amounts to 235,353*l.* 1*5s* *per annum.* and this would be the more melancholy, at a time, when from the *high* price of grain, *famine must inevitably* be in the house of many a *poor family*: but at the present price, which is about 16 shillings a barrel, this loss amounts to 94,141*l.* 10*s.* every year; *over and above* the *great loss* that is sustained by the same error, in

* From the accounts I have had here from some farmers, I think they throw away much more; but as the acres are much larger than in *England*, I therefore allow more than a proper proportion of what I think enough to sow an acre in *England*; where I think they throw away at least five pecks on each acre if not full out six; and I believe the loss there upon the same mistake, cannot amount to less than 600,000*l.* *per annum*, it being a larger country and more tillage abundantly in *proportion* than I have stated to be here.

† By cultivation I mean to include all lands that are employed for grazing, mowing, tillage &c.

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throwing away large quantities of barley, oats, and other kinds of grain; upon which was a calculation to be made; I much fear the loss to the Kingdom, would appear to be at least 300,000*l.* one year with another; but if the calculation was taken for seven years back, it would include the years 1756 and 57, which would raise the loss to a much larger sum.*

Under these considerations, I flatter myself my scheme for shewing what an abundance may be raised from a little, will not appear so chimerical and romantick as some people would imagine; and further, that premiums offered in the manner I have proposed, to the man who should raise the greatest quantity of grain from the smallest quantity of seed might in time be productive of a remedy, against the crying evil I have just now shewn: and therefore Gentlemen, permit me to urge *this* circumstance to Your consideration, however indifferently You may think of the rest of the plan this letter brings before You.

Suppose also, that a premium should be offered to the man that should raise 500 of the largest and finest artichokes in his fields in a stipulated time by the plough without manure of any kind; perhaps there are not many that would undertake it, till they

* Some perhaps may imagine I have supposed more ground to be under wheat than there really is; An argument that would confirm the evil to be still greater, as the importation would therefore increase, in proportion as my calculation is lessened, for which hard money must go out of the kingdom, for at all events bread must be had.

they should see or hear of its being 'executed. However, I have it in my power to say, that in the year 1760, I raised upwards of a hundred in that manner, which were as large and better flavoured than any in my garden; where I had so many, that I gave them away in abundance. *

Perhaps some people may think it *odd*, that I should so carefully *exclude* manure in my experiments; but if they will consider, what *vast tracts* of land are remote from populous towns, and that remain unimproved for want of manure, they will immediately see my *reason is*, to shew, that the *earth* herself is not so *reluctant* a parent in bringing forth her productions, as is too universally imagined; but that all she wants, is to be *unshackled* from the incumbrances that *spontaneously crowd* upon her: for certainly, if a nurse under whose care I put my child, lets her own take the greater part of her milk, the natural consequence will be that mine cannot thrive; which not being attended to, will be my fault. So that if the farmer will not move, stir and work about, and keep clean his earth, how can he be so *unreasonable* in his expectations, as to think she *can* bring forth *riches* unto him?

I shall not trouble You with any more of my little experiments, than upon the whole to assure You, I have upon the principles above-

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mentioned

* I should not have made this supposition, were it not the common notion that this plant is not to be raised without a large portion of of dung.

mentioned, raised grain to an amazing produce; colliflowers, raspberries, turnips and many other vegetables, to a very great perfection; and that I never found any method *so instructive* in this branch, as *real experiments*: and which I always executed in my fields.

But I cannot quit the circumstance of the great quantities of seed that are thrown away in the common method of culture, till I shew another *injurious consequence* it is of; in which *this country* is particularly and very *capitally* concerned.

The linnen manufacture of this kingdom, is an object of the utmost consequence to the nation: a trade, the country appears to be particularly happy in: and where a country, division or even a county, happens to be so fortunately possessed of a branch of trade; the manufacturers should *never lose sight* of that *grand object*: namely, the vending their commodity, whatever it be, at as *low a price as possible*; by which, all competitors would find the greater difficulty, in vending the like commodities in the markets which take them off. The manufacturers, the better to enable themselves to anticipate every opposition in their trade, should with the most *strict* attention, employ their *utmost talents and abilities*, for the *aid and improvement*; not *only* of the branch in which they are *immediately* concerned; but of *every other*, with which their manufacture may in *any degree* be connected. This rule, which should be *unalterably* attended to, and with the *utmost industry* pursued, leads me to
ask,

ask, whether it is not an object of the *first* consequence towards the *prosperity* of the *linnen manufacture* of this kingdom, that of raising *flax* in the *best* and *cheapest* manner? I know every man will answer in the affirmative. Might it not be well then, by variety of experiments, to shew the growers of flax, the *best* and *cheapest* method of raising that commodity?

I am told the province of *Ulster* makes near a quarter part of the kingdom, but as it is supposed not to be quite a quarter, I therefore state it at 2,987,537 of the plantation acres of this country. I am also informed, that the greater part of that province is employed in the cultivation of flax and oats, but in order to bring our calculation on this head *within* the quantity of land that I am told is *really* employed in this way; let us suppose *only one quarter part* of the quantity of land constituting that province, to be devoted to the raising of flax, in the whole kingdom; in that case it will be *only* 746,884 plantation acres; to sow which, I am informed the farmers use a barrel of seed to every acre; which at the present price, being 35 shillings a barrel, amounts to 1,307,047*l.* whereas, were there proper experiments made upon this article of husbandry in the manner I have proposed for a general improvement; the Society would be able to furnish a judicious and rational method of cultivating flax, not *only at a less expence*, but I am persuaded they would find, that there is by the present practice, *two bushels and a half of seed*
thrown

thrown away upon every acre, which, upon our stipulated quantity of land, amounts to 1,867,210 bushels, or 466,802 barrels and a half; which at the present price of 35 shillings a barrel, comes to 816,904*l.* 7*s.* 6*d.* *per annum*. This large sum of money must by *so much*, increase the price of flax to the purchasers, and when the linnens which are made of it, go to market, they must be unavoidably loaded with this great sum, by *so much* being added to their price. A circumstance that calls aloud for the consideration of every man concerned in the linnen manufactory, nay, I think of every native. But when we consider the large quantities of foreign seed that are imported here, it becomes *more serious*: and to form a judgment of the sum that *goes even out of the kingdom* annually on this account, we must calculate from the *common mode* of cultivation.

It is said foreign seed is required for the land every five years, without which change, the farmer will fail in his crop, as the seed will degenerate after that time. (a notion that is the child of ignorance and idleness) this maxim immediately points out, that the sum sent *out of the kingdom* annually for foreign flax seed, must be one fifth of the gross sum, that is lost every year in throwing away the seed in the manner already shewn, and therefore will be 163,380*l.* 17*s.* 6*d.* *per annum*. But the present price of seed I understand is very high, the more common *one* being 20 shillings or a guinea a barrel, at the lowest of which, upon the

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the quantity of acres supposed to be sown with flax, the *whole* loss amounts to 466,802*l.* 10*s.* 0*d.* per annum.

But suppose we even state the price *still lower*, and one time with another estimate it at *half the present price*, in that case it will be only 17*s.* 6*d.* a barrel; even then we shall find it amount to a very *aggravating* sum. *i. e.* 408,452*l.* 3*s.* 9*d.* per annum. A very large sum of money to be a *dead weight* upon the *linen manufacture*; and an object that certainly should exercise the talents of every ingenious man, to discover a remedy against so great and *national an evil*.

It perhaps may be imagined that I have in this calculation, supposed more land to be employed in this way, than there really is; but from the little information I have had, and the greatness of the *linen trade* of this kingdom, I am willing to believe my supposition is considerably within bounds; but should it be otherwise, it will certainly be worthy attention notwithstanding; since there cannot be a doubt of two bushels and a half of seed being thrown away upon every acre that is employed in the cultivation of flax: tho' I profess not to have made any *satisfactory* experiments on the cultivation of this plant, but from what little I *have* done, and the experiments I have made on other annual plants; with myself I have not the shadow of a doubt remaining, as to the
loss

loss on each acre being full out what I have stated.

But as I have already said, I have not made experiments that are sufficiently satisfactory to me by growing flax, yet I think the following calculations will go a great way to confirm what it may be thought I have pretty confidently laid down as to the quantity of seed that is really thrown away on each acre.

Perhaps there are not many men that have taken the pains to enquire how many grains of flax seed will make a barrel, which I am told should weigh 196 pounds: this information has enabled me to make an estimate of the number of grains therein: and if the seed are good, they will amount to about 15,800,000 grains in a barrel. An Irish plantation acre being 70,560 feet, multiplied by 144 as being the number of inches in a superficial foot, will shew an acre to contain 10,160,640 inches, which shews, that the farmers *use above one grain and a half to every inch*: hence I would only ask, how it is possible any plants can grow so near together? no, they cannot, it is imposing too great a task on so willing a parent, as we find the earth to be; ay, even so willing, as to give life to most of this prodigious number of grains; but for want of air and food, millions of them perish in their infant state. This I own demonstrates to me the truth of infinite quantities of seed being thrown away, not only in this, but in every other branch

branch of husbandry, where we sow for a seed or grain crop, and I hope every reader will be convinced of the fact.

Now let us examine what is likely to be a more proper quantity to sow upon an Irish plantation acre. If any man will examine, he will find six grains of flax seed will make an inch in length; and if we for a moment indulge the common notion of sowing thick, (which is certainly wrong in every respect, *) let them drill the seed in rows one foot asunder, and let every seed touch each other in the rows, and even in that case only 72 grains will be sown in a foot, which being the multiplicator of 70,560 as being the number of feet in an acre, we shall find the number of grains amount to only 5,080,320, which being divided by 5064 as being the number of grains in an ounce, we shall find the amount to be only 62 pounds 11 ounces and a quarter, (wanting 128 grains :) which will be only *one* bushel *one* peck, 15 ounces and a quarter; and if we subtract this quantity out of 196 pounds which is a barrel, we shall find the answer to be 133 pounds 4 ounces and 3 quarters, which is, even in this manner of sowing; a saving of *two* bushels and a *half*, and 10 pounds 12 ounces and 3 quarters on every acre: thus I flatter myself my opinion of two bushels and a half being thrown away on each acre in the present mode of culture, will be tolle-

* Except where we sow grass or other seeds to lay the land down for grazing or mowing.

rably well supported: but I hope I shall be pardoned in proceeding a little further; and will still indulge the farmer in crowding his ground: as thus. Suppose he sows by the assistance of a drill instrument, his seed in rows of a foot asunder, and one seed falls in every inch of the rows; in that case he will use only 12 grains to each foot, which being the multiplier of 70,560 (the feet in an acre) will shew the number of grains to be only 846,720, they being reduced to pounds in manner before mentioned, will shew the amount to be only 10 pounds 7 ounces and 1032 grains, which to avoid fractions of so trifling a nature, we will call a quarter of an ounce. If we deduct this quantity out of a barrel as we did the former, we shall find there would be saved in this way of sowing, 185 pounds 8 ounces and 3 quarters, which is *three bushels three pecks one pound twelve ounces and three quarters*. I flatter myself every reader will think such a disposition of seed quite thick enough; and I have no doubt but an acre sowed in either of these methods would afford more flax than was ever obtained from a barrel of seed sowed on the same quantity of ground: * what an insatiation it is then in the farmers to purchase such monstrous quantities of seed at so heavy an expence, and that even from foreigners, wantonly and

* For how commodiously and expeditiously might the weeding be executed, and how easy would it be even in this way to stir the ground in the intervals, which would afford new and fresh nourishment to the plants: but I have no doubt of still a better crop being obtained if the rows were 18 inches or two foot asunder.

and lavishly to throw it a way, without any kind of reason? indeed I cannot help thinking it is high time they should be better informed.

Even at the low price I just now stated the flax seed; i. e. 17s 6d a barrel; the sum upon my calculation that goes out of the kingdom, amounts to 81,690l, 8s, 9d *per annum*. I confess this is an idea that *I feel more* from, than I fear many of the natives do, at least than those who have not considered it, since I cannot see any reason why the like number of *farthings* should go out of the kingdom on this account; as I am *perfectly persuaded*, as good seed might be raised here, as any that is imported; and all that need be attended to in the changing seed, is to have for light land that which grew upon stiff ground, and for the latter, that which grew upon loamy ground. But the farmers have fixed upon a rule of cultivation, and it cannot be expected they will *ever depart* from it, till they are convinced of their own error by real experiments, judiciously plan'd, executed, and rendered intelligible to them. This leads me Gentlemen to submit to *Your consideration*, whether the plan I propose, for *Your* discovering proper methods of culture, as well, a general amendment of pasture, towards a universal improvement of husbandry, does not promise a certainty of success? as for instance, when You should have discovered an advantageous and judicious method of cultivating *flax, and its seed*, upon rational and certain princi-

ples, can there remain a doubt, but that premiums offered for the encouragement of such *mode* of culture would make it prevail, as soon as the farmers should begin to see the advantage, that would arise to themselves by pursuing it? and what an infinite source of pleasure would it afford to You, to be instrumental in saving such prodigious sums of money, as appear upon the present mode of culture to be lost to Your country? she hath the riches in herself that would aggrandize, exalt and make her great, but the most valuable diamond remaining unpolished by the artists hand, can never shew a lustre, altho' placed in the crown of the most exalted King.

My zeal on this subject I perceive hath almost betrayed me into a dictativeness! but I recollect to *Whom* I am writing; and therefore I stop the current of ideas that this great loss to the nation and heavy weight upon Your capital branch of trade, warms my imagination to let lose; the interestedness of which, will, I am persuaded shew more striking consequences to You, than my weak abilities can lay before You.

I am told above 60,000*l* a year goes out of the kingdom for hops. A circumstance also of a striking nature, and to which a remedy might be certainly found, if a proper and judicious mode of culture was discovered by experiments. I am
aware,

aware, many people object, that there are not poles in the kingdom; an objection so temporary, that it needs no answer, the very bogs that I frequently hear of, would produce them abundantly in a very few Years.

Your premiums for the planting of trees are much to be commended, and the people of the kingdom must be conscious of their obligations to You, for Your sanguine and liberal encouragement thereof: but it certainly cannot be imagined that every farmer knows how to plant trees, (tho' they may be tempted to try at it) I know they do not, of which I have seen many proofs in *England*, even to the entire destruction of new created plantations; and in others where they have dwindled, and always appeared unhealthy. Would it not be well then, and afford a greater prospect of the kingdom being properly timbered, were the Society to point out from experience, the best and most judicious method for the candidates to execute this work? I flatter myself You will think so; for altho' the trees You cause to be planted *may live*, & yet that answers not Your intention, unless they *flourish*;
which

* I cannot omit to notice one mistake I have observed here; which is that of cutting off the heads of young trees before planting; the motives for which I asked a gardiner, who gave me a very inconsistent answer, yet I dare say he thought it right: but there would be almost as much propriety in cutting off the head of an animal, in order to promote his growth.

which there might be certain rules and preparations calculated to promote, and confirmed by experiments. A plan founded on such principles, would also be a means of bringing new created orchards in a very little time, to *afford profit*,

If the scheme I have in this little performance proposed should ever be set on foot and supported by so Respectable a Body as constitutes Your Society; it is to be hoped every member thereof, who has any propensity to improvements of this kind, will consider of experiments to be made; and that such should be laid before a committee, for them to consider whether proper or improper to be tried.

Upon every publick lecture, each member of the Society should have an unlimited number of tickets, to distribute for the admission of such Gentlemen as would wish to be present, which might be attended with *two* good ends: first, that of their being made acquainted with matters tending to the improvement of husbandry, which would diffuse itself in conversation amongst others; and secondly, that it would certainly increase the number of subscriptions, which would tend to the rendering the premiums more extensive, for the improvement of husbandry, and the other useful arts.

The

The lectures both in theory and practice, should tend to the discovery of what is *really* the *food of plants*; which might lead us to the acquiring a proper composition as an artificial manure; for lands that lie remote from populous towns, and therefore, from the present mode of culture, cannot be provided with the refuse thereof, for want of which vast quantities remain as it were, in a state of nature, and totally unimproved.

The lecturer should also always have in view, and as fully as possible, endeavour to shew the effects, powers, and operations of bodies upon each other, which would certainly tend to the like discovery.

The nature, qualities, difference, composition and texture of earth, would come within the compass of such an undertaking; and from the variety of experiments that would of course arise and be made upon such a plan; the Society would be able to communicate to the world, for a general improvement, the best and various methods that of course would be discovered for the cultivation of our lands.

The qualities and compositions of air, fire, water, salt, animal, vegetable, and all other heterogeneous bodies, that are by nature or art employed

ed in vegetation, and other articles of husbandry ; would also of course come within the compass of such a plan ; their effects and operations upon each other shewn by experiments, and their contents demonstrated.

There would also in the theory of such an undertaking, some useful hints arise to Gentlemen of landed estates, for their analyzing, with very little trouble, any appearance of *ores*, *minerals*, and other subterraneous productions, that perhaps now remain unnoticed, and unexamined, from a prepossession, that such experiments are not to be made, without great expence and trouble.

There might be abundantly more said to shew the advantages that would inevitably arise to the publick from the scheme I have thus ventured to offer for Your consideration ; and which I have done in this publick manner, not without some timidity ; since there are a set of men in the world, who, altho' the subject is not directed to them ; yet if *they* should think it comes within the appellation of a *scheme* ; *that* alone will be enough to damn the whole in their estimation ; an inhumanity and rashness of no small prejudice to all kinds of improvement ; since it seems not to be considered, that all schemers, who really have *publick* benefits in view, are the most valuable, instead of being the most obnoxious of men,

which

which being otherwise conceived, is a very discouraging consideration, and certainly forbids many a man stepping forth, who may be very capable of doing much to serve his country, but happy for him as an *individual*, he has coolness and sagacity enough to discover, that *success alone*, is the *only characteristic of merit*.

I own Gentlemen, when these discouraging ideas struck me, I was almost prevailed upon, never to let this little production see the light: but when I began to consider, to *Whom* I address it, and to the consideration of *Whom* I submit it, I have resumed my former intention; and am the more encouraged thereto, when I consider that *Your institution* is a *scheme*, calculated for lasting and solid benefits to *Your country*; and when I recollect *WHO* it is that presides at the head of *Your Society*; I cast those intimidating ideas behind me; since I am sure, a Body of men, that have shewn such generous liberality, will observe as generous a tenderness in their scrutiny of this humble performance; presuming on which, I have thus *hurried* my thoughts together, heartily wishing they may be productive of any publick benefit, which would afford me a most transcendent pleasure; but should they not, permit me to assure You, I have at *least intended well*, and therefore rest its fate upon Your candour and lenity.

I might have been more explicit upon the few hints contained herein, and indeed I am con-

scious they require it, but that would have swelled the subject beyond the limits of my intention, which, as must appear by the performance, is calculated only to offer a few hints for Your consideration; who are so capable of improving on any subject that may be laid before You; and perhaps, had I not checked the temptation which this leads me to; it might be deemed an inconvenience, that the *merit* of Your institution ought not to expose You to: and therefore I conclude by requesting that Your Excellency, and the Gentlemen of the Worthy Society, will esteem me a member of the community, whose anxiety to be useful, greatly exceeds my abilities.

And that I am,

With the highest Sense of Regard,

Your most Obedient,

And Devoted Humble Servant,

I. W. B.

Dublin March 5th. 1762.



POSTSCRIPT.

SINCE Mr. *Flin* printed my letter, *The weekly observations* of Your Society, published in 1739, hath fallen into my hands; and I cannot but regret my not having seen that performance before the printing the one I have taken the liberty of addressing to You; for altho', those papers are few in number, and are confined only to a few articles; yet they afford such valuable materials, as would enable an inquisitive and speculative man, who hath opportunities of pursuing his enquiries by real experiments, to raise a superstructure, that would afford lasting and solid benefits to Your country; and had it been possible to increase my respect and veneration for Your Institution; the great desire to be useful and instructive that enhances the merit of those papers would have done it, and I believe, would have encouraged me to address You, even if I had remained in the neighbouring kingdom, had I seen them there. But as I never had that pleasure till yesterday morning, my little performance comes before You, without being embellished with those persuasive arguments and instructions, which adorns Your work, and might have been so used perhaps, as to have cast some merit upon mine, which, as it now stands, I am conscious can con-

list, only in the *ardent desire* of its author, to be useful.

However, I mean not by this little addition to my paper, to enter upon all the different subjects and articles that are contained in Your observations; but to confine myself principally to *one*, which, among *diverse others*, struck my imagination, the moment I had run over the list of imports, which stands in the front of Your book; out of which I drew an abstract of all such as are connected with, and dependant on the branch my letter means to promote, and I find they amounted, even in the year 1736-7 to no less than 275,386*l.* 9*s.* 8*d.* *per annum*, which, without supposing the evil to have increased, and without any interest upon the sums already lost, has amounted since that time, to 6,884,662*l.* 1*s.* 8*d.* a *melancholy* consideration to think, that *every article that sum is gone out of the kingdom for*, in only 25 Years; the *native soil herself* is capable (nay perhaps more so, than *that* of some of her neighbours) of producing in great abundance, were she treated with that *nurture*, which a *proper and national emulation*, should excite in her inhabitants. I own this circumstance warms me so, that I can almost imagine myself a native.

But I shall beg leave only to remark, that such a loss to the kingdom, seems to dictate, in the *most interesting terms*, that some such scheme as the one I have proposed, for the discovery of general improvements in husbandry, founded on proper experiments

experiments (for depend upon it, no other way can be so certainly advantageous or expeditious) should not be neglected; since such *capital* sums of money would be the *certain wages* to Your country for such an undertaking; which in a few years it is plain, would make the kingdom flow in sterling specie, and the better enable her to stand the *annual shock* she feels (as I am informed) from absentees.

But the article I mean now to touch upon is to be added to the sum I have already stated; but as not being immediately the produce of the land, I did not join it to the preceding sum. In Your list of imports You introduce *Salt* under two heads, i. e. *Foreign* at 1s. per bushel, amounting to 11,663l. 14s. 4d. *White from England* at 1s. per bushel, amounting to 13,770l. 4s. 6d. which sums together make 25,433l. 18s. 10d. per annum, and that even 25 years ago. But I observe You have taken no notice of *Rock-salt*, of which I was told, when I went to see the *Rock-salt pits* in *Cheshire*, large quantities are imported here for refining; but as You have omitted that in Your list, I conclude in the year 1737 it was not used in this kingdom; tho' now I suppose the money going from hence to *England* for it must amount to a considerable sum: and no doubt the inhabitants of *Ireland* are increased since that time so much, as greatly to have increased the importation of *Salt*, which still, by so much as *that* may be, will add to the *crying evils* this country certainly labours under,

under, from the readiness of her neighbours to supply her *for her money*, with what she hath in *herself*; which industry in them, it is not inconsistent to imagine, should excite in her inhabitants a contempt of being so fed and cloathed, to the forestaling of the food and raiment, which their own country apparently shews she is not only *capable*, but *willing* to afford them. I will not presume to call the neglect of such a conduct a fault in the natives; but they certainly will admit it to be a great mistake in their œconomy.

But suppose the importation of salt to be no more now than it was in the year 1737, I see no more reason why Ireland should throw away five or six and twenty thousand pounds a year for salt, than she should for the importation of air, which she shares among other blessings in common with all the world.

Perhaps she may not have any subterraneous salt springs; but to supply that seeming deficiency she is surrounded by the sea, that every tide offers her salt in abundance, which is rejected because her neighbours have found their way into *her* ports: and what renders this more extraordinary is, that in many parts of the world where they are *no better* supplied with brine or salt-water for making this commodity; yet they not only make for their *own* use, but also supply many of their neighbours with large quantities; but this country, as if she delighted in enriching others at the
expence

expende of her own *vitals*, neglects to make, even for her own consumption.

The manufacture of salt has engaged as much of my attention perhaps as any subject I ever considered, and I am therefore aware that some people may say, " we can import the salt as cheap as " we can make it from sea-water." Had I known this article would in *this manner* have fallen under my consideration, I would have been able in the time I have been here to answer positively as to such an assertion, and that more *accurately*, had I seen a summer here. But notwithstanding, I do not positively contradict such an assertion, yet I am pretty sanguine in *my belief* that the fact is *not so*. However if any man should happen to differ with me in opinion, and should think it *not worth while* to make Salt here from sea-water, because it *may* be imported as cheap as it can *possible* be made; he will not pretend to say that *Ireland* would loose a farthing less than the stipulated sum of 25,000*l.* a year and upwards: whereas, if it was made here, even to come to the consumer at no less a price than it now does, he surely will admit, all that sum would be saved to her inhabitants? which saving, *moderately* stipulated as it is, in about 39 years, (exclusive of the accumulating interest that ought to be charged with the present loss) would amount to about a million sterling: would not the nation in that case be a million richer than she will be at that period, if she continues to import, and does not make the salt
she

she consumes? I flatter myself, every man who thinks for posterity, will join me in opinion.

I come now to anticipate another objection that I foresee may be made, which is, “ that if salt
 “ was made here sufficient to supply the con-
 “ sumption of the Kingdom, that the importation
 “ of coals must be increased in order to make it,
 “ and that therefore if the money did not go out
 “ of the Kingdom for salt; it must for coals, and
 “ consequently there would be no saving to the
 “ country.” To which I give for answer, that I am told there are plenty of good coals in many parts of *Ireland*, the raising which I am informed is now under the consideration of the Legislature. But suppose the present intention of obtaining them should subside, and they are *not* in the kingdom: in that case I undertake to say the salt may be made *without fire*; tho’ I shall admit, a little would forward the process. It perhaps may be expected I should set forth the manner of doing it, but I hope I shall be excused in that, at least for the present, and request it may be admitted as sufficient for me to say, that I know from experiment it is to be done to advantage; and which I once thought of carrying into execution; and so earnest I was about it, that I believe there is not a salt work of any consequence in *Europe*, but what I have been pritty well informed of their different manners of working.

At *Limington* in *Hampshire* in *England*, (and many other places) the salt is made from sea water, where they sell it for about 26 shillings a ton exclusive of the duty. They have their coals from *Newcastle*. I confess I see no reason why it might not be made at the same rate here, but if it should cost even 40 shillings a ton or more, would not the nation save to her inhabitants all the principal sum that now goes annually out of the kingdom for this commodity?

Were I to proceed upon this subject, it would greatly exceed the bulk of my letter, to which this is intended only as a postscript; and therefore I shall come to the point which induced me to take any notice here, of this article,

It may be remembered that in my letter I spoke of salts as being useful in the propagation of plants; * and if the scheme I have taken the liberty to lay before You should ever take place; experiments will demonstrate marine salt, (as well as many others) † to be an ingredient that will be of infinite use to the kingdom in the improvement of the lands: and when it should, from Your proofs and recommendations of it, become of uni-

* See page 14, 15, 16, 17 and 18.

† Note the exception made page 16.

versal use with the farmer, we may form some little idea of what quantity might be consumed in that way, if we state it at two bushels to an acre every third year, and suppose only half the kingdom to be under *any kind* of cultivation, the whole of which, I have been informed since the finishing my letter, amounts to only 11,042,642 acres, † and the half will be 5,521,321 acres; the number of tons of salt for which, upon the quantity I have stipulated for each acre, will be 92,022 every year. This amount at 40 shillings a ton, would be a monstrous sum to go annually out of the kingdom: and if Your neighbours once discovered Your consumption so to increase, such is their folly (at least of the manufacturers) that they would raise the price upon You, perhaps equal to the prohibition it is under in *England* for the use of land, rendered so by the heavy duty, and the trouble the petty officers always give those who are inclined to use it. But if the salt was made upon the coasts of *Ireland*, the farmer could afford to fetch it into the most interior parts of the kingdom, as an ingredient to aid in the manure of his land, without being subject to the disappointments, the caprice or jealousy the neighbouring kingdoms probably would shew, as soon as they should discover to what vast advantage the salt was used.

Here

† See *Watson's Dublin Almanack* 1762 page 30.

Here then we see what an opportunity presents itself to the country, of not only saving the sums of money which go *out* of the Kingdom every year for this article; but that a manufactory may be introduced that would employ a great number of hands, that are every year strolling to *England* for work, * because their native country affords it not; and many of whom I have seen in different parts of *England*, (being strangers) languishing in disease, famine and the verge of death, (shame be it to every land of plenty) wanting the common supplies which nature calls for, and which *every animal* upon earth is intitled to, and *much more the human*.

Again we see, that if the schemes I propose should ever take place, and the farmers come to be instructed from your experience, how to use

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* Which I think amounts to a full confutation of the charge very sanguinly laid against the poor people of this Kingdom, that they not only want industry, but are really idle: how can they give greater proofs of the cruelty of that charge, than by going so far for labour? and were they fed, cloathed, housed, and employed as they ought to be, I have no doubt but they would shake off that sloth their misery involves them into, which is natural to human nature, when divested of every comfort, without one hope or agreeable point in view. Again, have we not daily proofs of the spirit and gallantry of these poor people in the field, when they are fed, cloathed and disciplined as they ought to be, where are the troops that will march, slave, or fight with more alacrity and resolution than they will? So that I cannot help thinking, they want only to be instructed and encouraged by their superiors, to render them of the same value to their country, that the labourer in every trading nation, is esteemed to be of to the community.

salt upon their land, how prodigiously the manufacture would *rise* in its consequence, above the one that would supply the present consumption; and what immense benefits would arise to the nation from it. It would employ an infinite number of men, women and children. As the lands improve by it, so would the inhabitants increase: * labour would become plenty for every labourer: It would lessen the vast sums of money already stated, to be annually going out of the Kingdom: It would increase the value of lands now lying remote and uncultivated: It would be felt in lowering the price of all kinds of provision, by which the poor cottager would share in the comforts of Life, which he seems at present to be totally divested off! money would appear in every hand, and you would become a great and opulent people within yourselves; whilst your neighbours sovereign dominion of the seas, would protect

* I am informed it is the practice in this Kingdom to throw the lands as much as possible into few hands, and that they are converted into grazing farms consisting of many thousand acres; a practice that may be beneficial to the holders of such farms; but no improvement can arise from it to the lands, nor benefit to the landed interest; and what is worse than all, such a practice *depopulates* the country; a mistake of a *very serious nature*; for however contemptibly the lower and midling people may be looked upon in a nation, yet every man that will give himself time to consider, will discover *them* to be the riches, support and bulwark of their country; when excited by their superiors to an industrious emulation; but depopulating a country to the emolument of a few, must end in her certain ruin; and that more suddenly, when she annually pours out her vitals, to fetch home what she hath in herself.

protect you from the insolence of every envious and aspiring enemy. Happy situation were it made a proper use off.

I cannot but remark the complaints that I have often heard, of the limitations this country is under respecting trade, to which I shall only answer, that the nation most remarkable for its advantages in trade, gains her riches not so much by that, as by *keeping* within her own dominions the treasure she gets, for she will purchase little or nothing from her neighbours that she can produce within herself; hence is the source of all her greatness. So immediately is *Ireland* allied to her, that I heartily wish to see her follow the sagacious example of her sister nation, since the greatness such an œconomy would *lift* her to, would render *her* also the envy of their *mutual* enemies.

I have only just offered the outlines for an undertaking of this kind; an infinite deal remains to be said; but by this time I must have tired your patience, and therefore shall conclude with only remarking, that I earnestly recommend every man to be careful how he uses salt upon his land, for in its crude and acrimonious state, injudiciously applied, it will be productive of great mischiefs, of which I have seen very mortifying ones; but when properly prepared, and judiciously employed, it will be productive of great benefits: And
therefore

therefore I hope, should You ever condescend to the putting in practice the scheme of having public lectures given, and trying experiments in the manner proposed, the article of salt will not escape your notice; since its manufacture here, and use upon the land, I am perfectly persuaded will afford lasting and solid benefits to your country; her obtaining which, permit me to assure You, no man wishes more heartily than I do, of which I hope this little performance will be deemed an earnest.

Dublin March 20th 1762.

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